RESEARCH ARTICLE

Comparison of Bearing and Yield Efficiency of Commercial Pear Cultivars on Pyrodwarf Semi-dwarfing Rootstock

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ABSTRACT

Abdollahi, H. 2021. Comparison of bearing and yield efficiency of commercial pear cultivars on Pyrodwarf semi-dwarfing rootstock. **Seed and Plant Journal 37:** 399- 423(in Persian).

Despite adaptability of Pyrodwarf semi-dwarf pear rootstock in Iran, the final bearing and yield efficiency of different commercial pear cultivars on this rootstock have not been studied and analyzed in detail. Therefore, in this study, fruit yield, yield potential and yield efficiency of four commercial pear cultivars including; Louis Bonne, Spadona, Dargazi and Beyrut on Pyrodwarf rootstock, in commercial bearing phase, were evaluated during four growing seasons (2017 to 2020). Growth traits considering vigorous growth of cv. Dargazi and cv. Spadona were higher than cv. Louise Bonne. All cultivars in 2020 (8 years old) had a tree height between 294.4 to 352.7 cm which indicated the semi-dwarfing habit of Pyrodwarf rootstock. The highest fruit yield per tree belonged to cv. Dargazi followed by cv. Spadona and cv. Louise Bonne, respectively. In spite of increase in fruit yield per tree, with aging of trees, the fruit yield per trunk cross-sectional area (TCSA) decreased consistently as this index was >0.2 kg cm^{-2} in 2017 in most cultivars and decreased to about 0.05 kg cm^{-2} TCSA in 2019 and 2020. A similar trend was observed for fruit number and yield per unit of canopy volume. The highest yileld efficiency per unit canopy volume was observed in cv. Louise Bonne. It can be concluded that for higher yield efficiency of pear cultivars on Pyrodwarf rootstock, evaluation of training forms that decrease the canopy shading in the internal part of the canopy is necessary.

Keywords: Pear, commercial bearing, canopy volume, Louise Bonne, Dargazi, commercial orchard.

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RESEARCH ARTICLE

Evaluation of Drought Tolerance in Rainfed Winter Bread Wheat (*Triticum aestivum* L.) Genotypes

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ABSTRACT

Roostaei, M., Jafarzadeh, J., and Eslami, R. 2021. Evaluation of drought tolerance in rainfed winter bread wheat (*Triticum aestivum* L.) genotypes**. Seed and Plant Journal 37:** 425-451 (in Persian).

To study drought to tolerance in rainfed winter bread wheat genotypes, 48 genotypes (lines and cultivars) were evaluated under two rainfed and supplemental irrigation conditions at Maragheh research field station, Maragheh, Iran, in 2018-19 and 2019-20 cropping cycles. The results of combined analysis of variance showed that effects of year, genotype and year × genotype interaction on day to heading, day to physiological maturity, grain filling duration, plant height, 1000-grain weight, biological yield, grain yield and harvest index were significant. The average grain yield of genotypes under rainfed conditions was 1707 kg ha^{-1}. The highest grain yield under rainfed conditions related to genotypes no. 4, 23, 20 and 26 with 2080, 2066, 2035 and 1999 kg ha^{-1}, respectively. Under supplemental irrigation conditions genotypes No. 13, 7, 11 and 25 with 3044, 3014, 2943 and 2914 kg ha^{-1} ,respectively, had the highest grain yield. Supplemental irrigation increased mean grain yield by 738 kg ha^{-1}, mean plant height by eight centimeter, mean 1000 grain weight by three grams and mean harvest index by four percent. Drought stress reduced grain yield of all genotypes. No significant correlation was observed between grain yield of genotypes under rainfed and supplemental irrigation conditions. Positive and significant correlations were observed between MP, GMP, HM, STI and YI with grain yield under rainfed (Ys) and supplemental irrigation (Yp) conditions which indicated the suitability of these indices for selection of genotypes with reasonable grain yield under either conditions. Based on the results of principal component analysis and three-dimensional diagram, genotypes no. 20, 23 and 26 were identified as drought tolerant genotypes with reasonable yield in both rainfed and supplemental irrigation conditions. Genotypes no. 13, 7, 11, 25 and 32 were also identified suitable for supplemental irrigation conditions.

Keywords: Bread wheat, grain yield, biological yield, 1000 grain weight and drought stress tolerance index.

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RESEARCH ARTICLE

Physiological and Biochemical Responses of Dargazi Seedling and Pyrodwarf Clonal Pear Rootstocks to Melatonin Application under Drought Stress Conditions

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ABSTRACT

Ebtedaei, M., Arzani, K., and Abdollahi, H. 2021. Physiological and biochemical responses of Dargazi seedling and Pyrodwarf clonal pear rootstocks to melatonin application under drought stress conditions. Seed and Plant Journal 37: 453-470 (in Persian).

In this research, the efficiency of melaton in for reducing the adverse effects of drought stress on two commercial pear rootstocks (Dergzi seedling and Pyrodwarf clonal rootstocks) was evaluated as factorial experiment in randomized complete block design with three replications for one year in the research greenhouse of Tarbiat Modares University, Tehran, Iran. For this purpose, 10 days before the application of drought stress, melatonin with a concentration of 100 μM was applied in the root environment of plants. Experimental factors included: rootstock at two levels (Dargazi seedling and Pyrodwarf clonal rootstocks), melatonin at two levels (without melatonin and 100 μM melatonin), drought stress (irrigation in 10 days interval and withholding water for 40 days) and duration (time) of dorugh stress at four levels (10, 20, 30 and 40 days after drought stress application). The results for chlorophyll content and maximum quantum efficiency of photosystem II showed that melatonin had significant effect on reducing the adverse effect of drought stress in both rootstocks. As the duration of drought stress increased, the rate of leaf chlorophyll degradation was less in the rootstocks treated with melatonin. The interaction effects of time × drought stress, drought stress × melatonin and melatonin × time on all studied traits were significant at the 5% and 1% probability levels. Melatonin pretreatment significantly prevented ion leakage and increased cell membrane stability index in both Dergzi and Pyrodwarf rootstocks. Also, melatonin pretreatment increased total phenol in the two rootstocks and improved plant tolerance to drought stress. The total phenol in plants under severe drought stress increased by 123 and 100 percent in comparison with Daragazi seedling and Pyrodwarf rootstock, respectively. The application of melatonin also contributed to higher uptake of nutrient elements of sodium, potassium and phosphorus under drought stress conditions.

Keywords: Pear, withholding water, Fv/Fm, membrane stability, total phenol.

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RESEARCH ARTICLE

Phenological and Pomological Evaluation of Some Apple Promising Genotypes

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ABSTRACT

Dodangeh Balakhani, M., Damyar, S., Kalantari, S., and Hassani, D. 2021. Phenological and pomological evaluation of some apple promising genotype**s. Seed and Plant Journal 37:** 471-488 (in Persian).

During the last two decades, valuable apple genetic resources have been collected and planted in the collection of native apple in Karaj, Iran. In present study, the phenological and pomological characteristics of 15 apple promising genotypes with cv. Golden Delicious and cv. Gala, as control cultivars were evaluated in Kamalshahr field station, Karaj, Iran, in 2012 and 2013. Considerable diversity for phenological and morphological traits was observed among apple genotypes. T-R1 and SH-R genotypes were the earliest flowering and B-K-KH was the latest flowering genotype. Apple promising genotypes showed overlapping for flowering time and grouped into early flowering, medium flowering and late flowering genotypes. T5 genotype had the lowest before harvest fruit drop, while KH-1 genotype had the highest fruit drop. SSB genotype had the highest fruit length, fruit diameter, fruit weight and flesh firmness, and in contrary GO-N3 genotype had the lowest values for these traits. M-N10 genotype was superior for fruit aroma, fruit taste and texture as well as overall fruit acceptability. The sweetest fruit belonged to "Golden Delicious" and the most sour fruit related to genotype T5. H1-SH genotype as well as GO-N3 were the earliest ripening cultivars. According to the results of this study, M-N10, M-N8 and H1-SH genotypes were superior in comparison with other apple promising genotypes for the overall acceptability of pomological and organoleptic characteristics. Finally, the M-N10, M-N8 and H1-SH genotypes were released in 2021 as new early and medium ripening apple cultivars with the names of Nima, Zagros and Shamin, respectively.

Keywords: Apple, flowering, early flowering, fruit drop, early ripening cultivar and medium ripening cultivar.

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RESEARCH ARTICLE

Macronutrients Uptake and Nitrogen Utlization Efficiency in Dargazi Seedling and Pyrodwarf Clonal Pear Rootstocks Under Drought Stress Conditions

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ABSTRACT

Maleki Asayesh, Z,. Arzani, K., Mokhtassi-Bidgoli, A., and Abdollahi, H. 2021. Macronutrients uptake and nitrogen utilization efficiency in dargazi seedling and pyrodwarf pear clonal rootstocks under drought stress conditions. **Seed and Plant Journal 37:** 489-511 (in Persian).

Using clonal rootstocks in modern temperate fruit orchards has expanded in recent years. Root system plays an important role in uptake of nutrients particularly under drought-stress conditions. Therefore, the present research was conducted to investigate the uptake and utilization efficiency of macronutrients in two commercial pear rootstocks (Dargazi seedling and Pyrodwarf clonal rootstocks) under drought stress conditions during 2019-21 in greenhouse and laboratories of department of horticultural science, Tarbiat Modares University, Tehran, Iran. The irrigation treatments were: control (100% FC), mild drought stress (60% FC), and severe drought stress (30% FC). The results showed that drought stress had different effects on the growth characteristics, uptake of nutrients in leaves and roots as well as traits related to nitrogen utilization efficiency of both pear rootstocks. In addition, decrease in nitrate reductase activity led to reduction in nitrate and ammonium content in the leaves of both rootstocks. The Pyrodwarf clonal rootstock under mild stress conditions had the highest root calcium content, total nitrogen accumulation, and nitrogen utilization efficiency which reflected in its better performance as compared to the Dargazi seedling rootstock. In contrast, the higher root: shoot ratio, root volume, root ammonium content, leaf calcium content, leaf nitrogen content, nitrogen efficiency ratio and nitrogen utilization efficiency in Dargazi seedling rootstock contributed to its better response to drought stress, particularly in severe stress conditions. These better responses could be attributed to differences in root systems in the two pear rootstocks which should be considered for selecting suitable rootstocks for establishment and management of pear orchards under drought stress conditions.

Keywords: Pear, calcium, nitrate reductase, root system, nutrients.

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RESEARCH ARTICLE

Flowering Phenology and Self-(in)compatibility Status of Some Apricot Genotypes Developed from Crossing Self-incompatible and Self-compatible Cultivars

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ABSTRACT

Orooji Salmasi, K., Gharesheikhbayat, R., Miri, S. M., Pirkhezri, M., and Davoodi, D. 2021. Flowering phenology and self-(in)compatibility status of some apricot genotypes developed from crossing self-incompatible and self-compatible cultivars. **Seed and Plant Journal 37:** 513- 530 (in Persian).

Apricot is one of the most economically important fruit trees in temperate regions of Iran and in the world. However, it usually produces low fruit yield, due to its self-incompatibility. In this study, self-incompatibility status and flowering phenological characteristics of 19 five-years-old apricot genotypes, developed from open-pollination of Iranian commercial apricot cultivars; Shahroudi and Shams as female parents, and Italian cultivars; San Castrese, Palumella, Vitillo and Cafona as male parents, were evaluated. Timing of blooming, blooming duration, pollen germination (%), fruit set (%), timing of fruit ripening and some other traits were evaluated and recorded. The results showed that apricot genotypes were significantly different for timing of flowering, pollen germination (%), fruit formation (%) and timing of fruit ripening. Mean comparison showed that the highest pollen germination (%) belonged to genotype 525 (69%) and the lowest to genotype 579 (5.2%). Evaluation of data from controlled pollination and fluorescent microscopy study showed that 13 genotypes 431, 446, 432, 446, 451, 526, 546, 557, 565, 570, 576, 579 and 585 could be considered as self-compatible genotypes. Correlation coefficients showed that there was negative and highly significant relationship (r = -0.63**) in first year and (r = -0.48**) in second year, between timing of flowering and fruit ripening. Also correlation coefficient between pollen germination (%) and initial fruit set (%) was positive and highly significant (r = 0.97**). The results of this study implied that self-compatibility is easily transferred from parents to progenies, and the two identified late flowering genotypes can be used in apricot breeding programs.

Keywords: Apricot, pollen germination, timing of flowering, pollination, fluorescent microscopy.

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